JPRS 69448

19 July 1977

EAST

EUROPE

TRANSLATIONS ON EASTERN EUROPE

SCIENTIFIC AFFAIRS

No. 553

U. S. JOINT PUBLICATIONS RESEARCH SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22151. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available through Bell & Howell, Old Mansfield Road, Wooster, Ohio, 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

BIBLIOGRAPHIC DATA SHEET	1. Report No. JPRS 69448	2.	3. Recipient's Accession No.
4. Title and Subtitle TRANSLATIONS ON EASTERN EUROPE - SCIENTIFIC AFFAIRS, No. 553			5. Report Date 19 July 1977
			6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201			10. Project/Task/Work Unit No.
			11. Contract/Grant No.
12. Sponsoring Organization Name and Address As above			13. Type of Report & Period Covered
			14.

15. Supplementary Notes

16. Abstracts

The serial report contains articles concerning the development of and progress in the various theoretical and applied scientific disciplines and technical fields; and the administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences.

17. Key Words and Document Analysis. 17a. Descriptors

___ International Affairs
___ Albania
_x_ Bulgaria
___ Czechoslovakia
_x_ East Germany
_x_ Hungary
_x_ Poland
_x_ Romania
_x_ Yugoslavia

Scientific Societies
Research Management
Organizations
Research

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group 5B

18. Availability Statement	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 43
Unlimited Availability Sold by NTIS Springfield, Virginia 22151	20. Security Class (This Page UNCLASSIFIED	22. Price A03

FORM NTIS-35 (REV. 3-72)

THIS FORM MAY BE REPRODUCED

USCOMM-DC 14952-P72

JPRS 69448

19 July 1977

TRANSLATIONS ON EASTERN EUROPE

SCIENTIFIC AFFAIRS

No. 553

CONTENTS

BULGARIA

PRODUCTS OF THE SEMICONDUCTORS COMBINE IN BOTEVGRAD

Sofia IKONOMICHESKI ZHIVOT in Bulgarian 8 Jun 77 p 15

[Article: "Economic Combine for Semiconductors in Botevgrad"]

[Text] The Scientific-Production Combine for Semiconductor Equipment in Botevgrad is the only enterprise of its kind in Bulgaria. Its main task is to satisfy to a maximal extent the needs of the domestic electrical engineering, radio electronic, and computer industry with high quality electronic components.

In fact, the history of the combine is the history of its three basic branches--the Semiconductor Equipment Plant in Botevgrad, the Institute for Semiconductor Equipment in Botevgrad, and the Institute of Microelectronics in Sofia. Its history is short compared with the development of semiconductor technology on a worldwide scale. However, it is characterized by the tempestuous rates of development and gains inherent in our socialist economy.

The development of semiconductor equipment in Bulgaria began with the completion of the Semiconductors Plant in Botevgrad, in 1965. The beginning was marked with the mastering and regular utilization of a series of germanium semiconductor instruments produced on the basis of a license.

Within a short period of time, thanks to the great enthusiasm, dedication, and patriotism of construction workers, engineering and technical cadres, and workers, the following items were mastered and produced on a regular basis:

Germanium point-contact and rectifier diodes;

Germanium low-power low-frequency and high-frequency transistors;

Germanium medium-power low-frequency transistors;

Germanium large-power low-frequency transistors.

As a result of the effectively organized production process the capital investments needed for the purchasing, mastering, and utilization of the license have been recovered and the economic effect on the national economy has been substantial.

In accordance with the requirements of the domestic industry and with a view to improving the technical and economic indicators of the items produced and to increase the variety, subsequently two development units were set up, now part of the combine--the Institute for Semiconductor Equipment in Botevgrad and the Institute for Microelectronics in Sofia.

As a result of the active efforts of the two institutes, the fruitful cooperation of the Semiconductors Plant in Botevgrad, and the help of the fraternal socialist countries, the USSR above all, in several years a number of new instruments were developed, mastered, and produced on a regular basis, as follows:

Silicium planer-epitaxial low-power and medium-power transistors in metal-glass and plastic housing;

Silicium pulse diodes in plastic housing;

Silicium low-power rectifier diodes;

Silicium medium-power rectifier diodes;

Silicium large-power rectifier diodes;

Thyristors up to 10 A;

MOS-integrated circuits with random logic;

MOS-integrated circuits for bench calculators;

MOS-integrated circuits for digital control;

MOS-integrated circuits for telephony;

MOS-integrated circuits of the ROM type, 12 bits or less;

MOS-integrated circuits of the RAM type, 512 bits or less;

Lamellar and hybrid integrated circuits.

The main tasks which continue to face the institutes are the following:

Improving and modernizing existing technologies, technological processes, and instruments;

Developing and applying new progressive and effective technologies and goods;

Designing and manufacturing new highly productive testing and technological-production equipment and apparatus.

The scientific-production semiconductor equipment combine in Botevgrad successfully fulfilled its 1976 production program. Its overall industrial output rose 15 percent over 1975.

Various types of Bulgarian calculators manufactured with MOS-integrated circuits, transistors and diodes produced by the combine are being well received in the country and abroad.

Each component of computer equipment produced in Bulgaria includes Bulgarian low-power and medium-power silicium transistors 2T 3604 ÷ 2T 3607; 2T 6551 and 2T 6552; 2T 3850 and 2T 3851; and 2T 6821; germanium large-power transistors of the GT7 series; silicium pulse diodes 2D 5605 ÷ 2D 5612; silicium rectifier diodes D 226; MOS-integrated circuits of the SM 8001 type; T7 thyristors and many others.

The nature of semiconductor output is such that the real effect of such an output on the national economy is achieved by the consumers whose items, frequently manufactured for export, include instruments produced by the Scientific-Production Combine for Semiconductor Equipment in Botevgrad.

The dynamic development of semiconductor equipment on a worldwide scale and the steadily growing requirements of the consumers of semiconductor instruments call for constant quality improvements, for upgrading production effectiveness, and for systematically renovating the variety of goods produced by the combine.

In the next 1 or 2 years the share of integrated circuits produced by the combine will become the determining feature of the production program. Soon some entirely new instruments will be mastered and produced on a regular basis, such as the following:

MOS-internal memory systems with a capacity of up to four bits, static and dynamic;

MOS-permanent storage systems with a capacity of up to 16 bits;

Large-power silicium transistors with dissipation power of up to 65 VV;

MOS-integrated circuits for bench and pocket calculators;

Linear bipolar integrated circuits;

Optical electronic equipment.

In the current five-year plan, along with the fulfillment of its production plan, the combine faces another responsible assignment: to modernize and reconstruct its production capacities with a view to upgrading labor effectiveness and productivity.

Gradually, in the individual years of the five-year plan, this process will cover all seperate production facilities. The skill and dedication of the many highly skilled specialists and scientific workers within the combine's system are a guarantee of the successful implementation of this task.

Specialization and cooperation on a bilateral and multilateral basis with the other socialist countries are an important prerequisite for upgrading the quality and effectiveness of output. The Scientific-Production Combine for Semiconductor Equipment in Botevgrad is already representing Bulgaria as a party to several contracts for specialization and cooperation in the fields of production and scientific and technical cooperation. The intensification and acceleration of the integration process among socialist countries is a safe guarantee for the successful fulfillment and over-fulfillment of the five-year plan.

5003
CSO: 2202

EAST GERMANY

PROGRESS IN ISOTOPE TECHNOLOGY DEVELOPMENT, APPLICATION

East Berlin SPEKTRUM in German No 5, May 77 pp 27-30

[Article by Dr Habil Klaus Wetzel, professor and director of the Central Institute for Isotope and Radiation Research]

[Text] It was established in the directive to the 1976-1980 Five-Year Plan that isotope and radiation technology is to be further developed as one of the prerequisites for the realization of key tasks of basic scientific-technical research. In order to be able to do justice to the responsibility of our Central Institute [for Isotope and Radiation Research], as formulated in this [directive], a well-thought-out strategy for the rapid development of isotope and radiation technology is needed as a factor of intensification of our economy.

As far as the strategy for our own research activity is concerned, it is primarily a matter of concentrating on the subjects of isotope radiation research. In this connection three key points have been established:

--researching events during the penetration of ionizing radiation through materials,

--researching the regularities of the spread of isotopes in nature,

--the isolation of selected fission nuclides from nuclear fuel wastes and the opening up of possibilities for using such fission nuclides in industry and agriculture.

In treating these topics both findings and results for nuclear research and technology arise which include isotope and radiation research and technology, as well as findings and results for other disciplines and for industry, agriculture and public health.

An institute that has the task of creating scientific and scientific-technical bases for the development of isotope and radiation technology in the GDR, however, cannot let it go with the investigation of the objects

of isotope radiation research. The opening up of enormous possibilities for the use of radioactive and stable isotopes for tagging chemical elements and compounds, with the goal of following them with chemical, biological, geological, technological and other processes, presupposes rather the use of an appropriate capacity for the development of the bases of tracer technology and for its use for the solution of selected problems. In this regard we are concentrating on the development of the production analysis and use of N-15, autoradiography and on the preparation of in vitro tests for medical diagnosis.

In the area of N-15 technology the GDR occupies a leading world position which requires great efforts to be maintained and expanded. In this area the Central Institute for Isotope and Radiation Research comes closest to the requirements that are formulated, along the line of the orientation of our academy, for the creation of complex solutions of overall economic importance.

The stable isotope N-15 plays an important role in the explanation of processes in nature and technology in which nitrogen is involved. The radioactive isotopes of nitrogen have half-life periods of seconds up to a few minutes and can, therefore, be used for tagging experiments only in exceptional cases. In view of the role of nitrogen in nature and technology we nonetheless started on the development of an efficient N-15 technology almost 20 years ago. Included in this is the making available of large quantities of N-15 in a broad palette of organic and inorganic nitrogen compounds. In the Bitterfeld Chemical Combine VEB, at present, two systems are installed that work on the principle of chemical transfer in the system HNO_3/NO, these systems permit production of kilo-quantities of N-15 each year with over 99 atom-percent N-15. The research work for this was accomplished in our institute in cooepration with the chemical combine. From the basic substances thus produced, more than 200 chemical compounds tagged with N-15 are being produced by Berlin-Chemistry VEB, likewise on the basis of our research work.

This method of emission spectrometric N-15 analysis has joined mass spectrometric nitrogen-isotope analysis as a standard method. Basic investigations in the past 15 years have shown that electron oscillation bands of the nitrogen molecules, which are part of the $C^3\pi$ $B^3\pi$ transfer, are particularly suited to this. In regard to the higher transfers, isotope effects appear which permit getting by with simple dispersion equipment, in the case of which, in the image plane, the isotope band edges are separated from each other by 0.2 mm. Thus, in devices produced to date by our institute and by the Statron VEB at Fuerstenwalde, use was made of the simple mirror monochromator SPM-1 with a 56°NaCl prism from the Carl Zeiss VEB.

To stimulate gas discharge, high frequency and microwave generators are used with frequencies from 27 megahertz to 2.4 gigahertz. In our NOI-series, generators with a frequency of 27.12 megahertz are used. On the basis of our research results the Statron VEB at Fuerstenwalde is producing a non-automatic device, NOI-5, and the automatic Isonitromat 5200.

The NOI-5 is a discontinuously operating device, into which the previously prepared small gas discharge tubes are put, and the spectra recorded must be manually evaluated.

The Isonitromat 5200 permits the processing of suitable nitrogen compounds (in this case these are all materials reacting with NaOBr with formation of N_2, especially ammonium salts and amides) into molecular nitrogen, its introduction into the gas discharge tube with the aid of helium as the carrier gas, the scanning of the spectra in the sector of interest with the aid of an oscillating gap and a secondary electron multiplier and the calculation of the relative frequency of N-15 from the intensities of the band edges measured and the output of these results in the automatic operation.

In order to further the use of N-15 in the GDR and to assure a larger foreign market for the production of this isotope and the compounds tagged with it, as well as the NOI-5 and Isonitromat 5200 devices, new technologies are also being prepared by our institute for the chemical processing of compounds containing nitrogen for nitrogen-isotope analysis and the soft ware for the evaluation of tagging experiments with N-15. Beyond that, we are carrying out model investigations of a complex character with the help of N-15 technology.

Thus, in the framework of a larger research program, realized in cooperation with other institutes of the advanced school system and the Academy of Sciences, the cycle of nitrogen was investigated in the following chain: fertilizing with N-15--cultivation of N-15-tagged plants--feeding of these plants to cows--elimination of N-15-tagged organic dung--application of this dung and return to the cycle.

These experiments permit quantitative determination of the degree of utilization of inorganic and organic fertilizers and the uncovering of the origin of nitrogen losses under various technological conditions. Finally, a model of nitrogen metabolism in the earth--plant--animal system could be worked out.

A further research program in our institute is devoted to the synthesis and analysis of protein in growing plants. In this research the plant nitrogen is broken down into soluble and protein nitrogen and investigated in terms of quantity and isotope composition. With the help of a compartment model, with these two compartments the turnover times of nitrogen in individual parts of the plant and the influence of agents on these times can be determined.

Most recent investigations, done jointly with Karl-Marx University in Leipzig, are oriented toward the introduction of N-15 technology into medical research and diagnosis. In this way we create the prerequisites for N-15 technology to be of service to the well-being of man not only indirectly, as in the area of agricultural-scientific research, but also directly.

A good example of the complex use of isotope-technical methods are the investigations in the area of briquet production, which was stimulated by a rationalization conference held in 1975 jointly with the first secretary of the Leipzig Bezirk Directorate of the SED. Tagging crude brown coal with the radioactive isotopes Na-24 and La-140 made it possible to determine the lingering period and lingering period spectrum of the various coals in the individual stages of briquet production (drying, grinding, pressing). It became apparent that the average lingering period is much smaller than had previously been assumed. The operation plan introduced on the basis of these findings in the Deutzen Briquet Factory of the Regis Brown Coal Combine VEB resulted in the ability to lower the scrap percentage rate by one-half.

Autoradiographic investigations and the evaluations of autoradiographic images with the densitron provided data about the distribution of the different kinds of crude brown coal in the finished briquet. It also turned out that the densitron, in a direct way, provides evidence about the structure of the briquet, because the carbon granules and pores vary in their gray value and can thus be made visible in various colors on the screen and can be quantitatively determined in regard to their share in the surface. This method permits a quality control of the briquets in 2 minutes, whereas the usual method (counting out under the microscope) takes several hours of difficult work.

The CNO-analyzer developed by us, and working on the principle of X-ray flourescence excitation by ^{241}Am-α-radiation offers an elegant possibility for determining the carbon content (proportional to the calorific value).

β-backscattering helps us determine the ash content of the various coals; the composition of the ash can be determined by activation analysis.

The problems on which we concentrate in the use of tracer technology are chosen by us according to the following points of view: First, they must be of great economic or scientific consequence; and, second, they should be problems whose solution requires isotope-technical investigations which can only be carried out by our institute because they demand either a substantial isotope-technical advance or because they presuppose the complex use of many methods of isotope technology which are not available to other units.

The capabilities of isotope and radiation technology in the intensification of industrial and agricultural production and in the development of our public health system are still not being sufficiently utilized. Therefore, in the choice of our projects we turn to still a third criterion: Our cooperating partner should be ready and in a position to continue the work after the isotope-technical advance has been worked out by us and the value of isotope technology has been put to the test. Only in this way can we release forces to stimulate the use of isotopes in ever-new sectors.

PHOTO CAPTIONS

p 27

The electron resonance spectrum produced in the Center for Equipment Production of the Academy of Sciences, being used in the Central Institute for Isotope and Radiation Research to develop new methods for investigating the kinetics of radiation-chemical reactions.

p 28 (left)

Determining the relative isotope frequency with an error of less than one part per thousand is the task of precision isotope analysis. It is being practiced in the Central Institute for Isotope and Radiation Research primarily on nitrogen and carbon dioxide.

p 28 (right)

Preparation of a pulse radiolysis experiment on the electron linear accelerator ELIT 1. The ray tracing can be clearly discerned, which leads to a special magnet located in the adjoining room. With this experimental procedure liquid samples, primarily hydrocarbons, are being analyzed with the help of time-dissolving, electron-resonance spectrometry.

p 29 (left)

Intensification of research also means sensible use of proven devices of an older type. Here the ion source of a mass spectrometer is being reoutfitted for measurements of isotope composition of nitrogen.

0 29 (right)

Microdiffusion with the aid of a rotation device in which substances containing ammonium (by binding the ammonium to sulphuric acid) are prepared to determine the N-15 content.

12124
CSO: 2302

COMPUTER ENGINEERS AWARDED NEUMANN MEDAL

Budapest SZAMITASTECHNIKA in Hungarian May 77 p 2

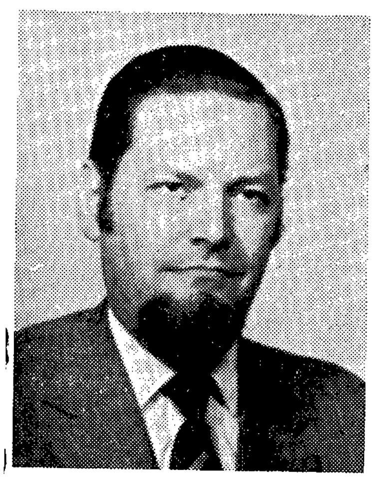
[Article: "This Year's Neumann Medal Awardees"]

[Text] Dr Bela Kreko has been involved with computer technology since 1958. He is one of the country's pioneers in operations research from whose pen flowed the first book on linear programming. This was followed by more technical works, several of which were translated into foreign languages. Since 1954 he has been teaching at Karl Marx University of Economics. His interest in the application of mathematical methods to economic problems, which applications are impossible without computer technology, led him to computer studies; he has been director of the University computer center since 1964. He is a mathematical studies candidate and professor at the University of Economics.

He has been connected with the work of NJSZT (Janos Neumann Society of Computer Technology) since its beginnings, and for a long time directed the Teaching Committee. He is Hungarian representative to IFIP TC-3 and is currently the Society's vice-president.

Dr Daniel Muszka has been occupied with computer technology since 1957. As a colleague of Laszlo Kalman he became involved with transport cybernetics and with the biological applications of computer technology. Currently he is the technical chief of the JATE (Jozsef Attila University of Sciences) Cybernetics Laboratory. He was a founding member of the NJSZT's (Janos Neumann Society of Computer Technology) legal predecessors. In 1969 he took part in the formation of the first rural chapter of the NJSZT-in Csongrad County- and has been its secretary ever since. Since 1970, this chapter has annually arranged at Szeged the colloquium entitled: "The Application of Computer Technology and Cybernetical Methods to Medical Science and Biology." Dr Muszka is president of the colloquium's organizing committee and also of the editorial committee responsible for publishing the colloquium's proceedings. He is an active participant in the life of the Society and is always willing to share the necessary work.

Tibor Szentivanyi was among the first in our country to take an interest in computer technology. As early as 1954, he participated in the development of an optical principle card reader. From there he achieved success with the development of various types of data storage devices. His work is reflected in nearly 50 publications and addresses before conferences. He took part in the installation of the country's first computer, the M-3. He is the main department head of SZAMKI [Computer Technology Research Institute] and member of the editorial board for national and foreign professional publications.



He is, and has been since 1959, a regular participant in the volunteer programs of MTESZ (Federation of Technical and Scientific Associations). In the beginning he worked within MATE (Scientific Association on Measures and Automation) and GTE (Scientific Association for Machine Building) then in OPAKFI (Optics, Acoustics and Film Technology Association.) He was instrumental in uniting the efforts of the then scattered and independently working experts in computer technology by helping to

found new organizations, first IKOSZ (Central Department for Information Processing, Cybernetics and Operations Research), the AIOT (Automation, Information Processing and Operational Research Council), then finally JNSZT. From the beginning he actively participated in the work of the Society. Since the formation of the Computer Technology Division, he has fruitfully functioned as its director. He is the initiator and organizer of the Society's and MTESZ's (Federation of Technical and Scientific Associations) most prestigious international program,the triennial Computer Conference. He represents the Society in the IFIP TC-6 committee where his work has contributed greatly to international recognition of our country's achievements in the field. He made significant contributions to the work of surveying and making known the life and work of the Society's namesake, Janos Neumann.

9093
CSO: 2502

BRIEFS

COMPUTERIZED RAIL TRAFFIC CONTROL--Operational testing of the computer system which will soon be installed at the Komarom railroad station has been completed at the Computer Technology Coordinating Institute. With the new type of equipment which is being used for the first time at a domestic railway station, the passenger and freight traffic of the border crossing station will be controlled. The system includes punch card scanners, radio transmitter-receiver, telex machines, TV monitors and industrial cameras. These elements will analyze, record and store data arriving from various parts of the country. Trains arriving at the station will be switched to rails determined by the automatic equipment. [Budapest MAGYAR HIRLAP in Hungarian 5 Jul 77 p 4]

SPRAY NOZZLE, MOSQUITO REPELLENT DEVICE--Headquarters of KOJAL [Public Health, Epidemiological Stations] reports that this year helicopters rented from the Plant Protection Service are being used to combat mosquitoes. The helicopters are equipped with spray nozzles which break up the chemical to a fineness of 30 microns. The spray is so fine that it is imperceptible to both eyes and skin. The device can process an area of 1,000-1,500 hectares per hour. UJITOK LAPJA [the innovators' journal] describes a pocket-size mosquito repellent developed by the army. The electronic device weighs cca 10 decagrams and is activated by a 9-volt battery. It has a range of 2-4 meters. Known as the Denever [Bat], it will be turned over to a civilian enterprise for production. [Budapest HETFOI HIREK in Hungarian 20 Jun 77 p 1]

CSO: 2502

JS 1050, JS 1032 COMPUTERS DESCRIBED

Warsaw HORYZONTY TECHNIKI in Polish No 4, Apr 77 p 17

[Text] With regard to computation capacity, the largest unit is the JS 1050 computer, produced serially in the USSR. We shall also devote our attention to this computer.

Like the other computers of the Uniform System, the JS has a uniform and compatible logic architecture, a uniform system and utilization programming as well as a uniform system of external equipment. The JS 1050 digital computer belongs to a class of large computers with regard to their internal stores as well as their several channels of information transmission. That is to say, it is a multiprogram computer. The average speed amounts to 500,000 operations per second (as an illustration: the JS 1010 has 10,000 operations per second, the JS 1020--20,000 and the JS 1032 around 300,000). The size of the built-in internal store ranges from 256 to 1,024 kilobytes. Because of the memory capacity as well as the number of operations per second, it is assigned to large computer centers.

The logic architecture of the JS 1050 meets the requirements for a contemporary computer system with regard to its structure and also its technical solutions (integrated circuits of a large scale integration). The system is typified by the opportunities to equip it with diverse input-output devices. It has a modular construction which allows for a flexible arranging of the configuration of various equipment depending on the needs and designation.

The internal store of the JS 1050 serves to store data (information) and instructions. The smallest stored unit of information in the memory is the byte. The maximum capacity of the 1050 memory system is 16,777,216 bytes.

The central unit (the data processor) controls the execution of stored instructions in the memory as well as the activity of the input and output information devices (i.e. the peripheral devices).

The JS 1050 computer may be equipped with the following devices:

--paper tape readers and punches,
--card readers and card punches,
--line printers,
--electric typewriters,
--monitor screens,
--disc, tape, and drum external stores,
--telecommunications equipment (subscriber points),
--digital plotters.

The JS 1050 can work with the 256 peripheral devices while simultaneously carrying out many computer programs.

As we stated, the basic unit of information in the RYAD system is the byte and because of this, it is frequently said that these are byte computers as opposed to the bit-type computers (e.g. the Odra 1300 series produced in Poland are bit computers). A byte contains eight bits plus a check bit.

The first JS 1050 computer installed in the Center for Electronic Computation (ZETO) in Katowice will fulfill the functions of a regional computation center, cooperating with several smaller computers in the Upper Silesia area. Already, terminals in the form of monitor screens are being installed at customers of the ZETO (e.g. in the Katowice PKO [Polish Security Bank] branch) with the help of which, one can obtain information immediately on the status of each PKO client's account. After using the data transmission line of all of the JS 1020 computers, and in the Katowice ZETO there are five, they will be connected in one network with the central JS 1050 computer. Users of computer services, similar to those currently used in the PKO example, will obtain a direct link with the main center of computer services in the ZETO in Katowice.

Finally, it is worthwhile to add that the JS 1050 computer is a universal system, that is, that with its help, one can accomplish the most diverse tasks: scientific, technical or economic computations. The cost of such a system amounts to about 130 million zlotys.

CSO: 2602

electrochronography; of the technique, the American professor Young S. Kline -- as one example among many -- wrote in the magazine NATIONAL ENQUIRER: "This is a major discovery, which offers the possibility of using in medicine the electric field of the human body. It will be extremely important in the early diagnosis of some illnesses, and will especially provide a new hope in cancer cures."

At the recently concluded congress, Ioan Florin Dumitrescu presented the latest results of his persevering work in a number of papers and a series of instruments, most of the latter patented and unique in the medical world. While he also served as chairman of the organizing commitee, he offered such notable papers as "Electrochronographic Image of Acupuncture Points," and "Electrographic Methods in the Electrophysiologic Study of Active Points," which became topics for learned scientific discussions. In these discussions, outstanding personalities in medicine, physics, and psychology, knowledgeable about the essential aspects of these questions, among which were: Dr Thelma Moss of the University of Los Angeles; Rolf von Leitner, chairman of the World Union of Acupuncture Societies and Acupuncture Physicians; Professor Musa Usova of the Moscow University; and Dr Frederico Spaeth, chairman of the Brasil Society of Acupuncture, commented on the advances of Romanian research, stressing its contribution to the general progress of medicine. On an associated topic, Drs A. Tarpa and D. Camarzan read their paper "Electrochronographic Explorations in Labor Medicine. The Role of Electrodermal Points in Diagnosis," which was also noted by the congress participants for its new findings based on an extended laboratory study.

As we have indicated, as part of the applied technology show of the congress, Ioan Florin Dumitrescu and his collaborators presented a number of patented instruments, improvements and refinements of practical devices which have already been discussed in these pages. One of the electrochronographs installed at the Turist Hotel, the site of the congress, was the latest type of such instruments, built in collaboration with professor Anton Policek of the Timisoara Polytechnic Institute; as an absolute technological first, this electrochronograph provides total protection for the heart against large power discharges. Together with the instrument for electroluminescence spectrography, a new phenomenon which the Romanian doctor resolved for the first time in a program directed with clarity and authority by CNST (National Council for Science and Technology); together with the instrument for neurovegetative reactometry, built in collaboration with the Timisoara Polytechnic; and together with the instrument for acupuncture electroanalgesia, built with the participation of two renowned specialists from the Atomic Physics Institute, professor Ion Purica and engineer Elisabeta Zaharias, the technologists in attendance were able to witness the operation of another last minute invention of Ioan Florin Dumitrescu, the device for television processing of electrochronographic and microelectrochronographic images, which also impressed the audience by its novelty.

ROMANIA

INTERNATIONAL CONGRESS ON ACUPUNCTURE HELD IN BUCHAREST

Bucharest FLACARA in Romanian 9 Jun 77 p 7

[Article by Traian Iordachescu]

[Text]

The International Congress on Scientific Acupuncture and Applied Technology, a meeting of great prestige, was held in Bucharest from 27 to 30 May; it gathered nearly 400 representatives, doctors, biologists, physicists, chemists, engineers, and others, from 27 countries from all the continents, and once more demonstrated the great qualities of the Romanian school of science and technology. The papers and instruments presented by Romania stressed the originality and pioneering nature of our country's research, as well as its serious nature and its depth. Foremost among the communications presented at the meeting, were those of Dr Ioan Florin Dumitrescu, who has been recently respectfully recognized by the international scientific world as a leader in the fields of electronography and electroluminescence spectrography; his merit as a pathfinding researcher is well known, and although still young, he is the author of 25 invention patents and the holder of numerous distinctions awarded abroad. FLACARA has already written about these facts, observing that the investigative methods conceived and applied by Ioan Florin Dumitrescu in his laboratory at the Center for Work Protection and Hygiene, of the Ministry of the Chemical Industry, have made it possible to obtain an unknown image of living structures, and draw the first electric map of the human organism, using surface images or photographs of internal organs. In other words, he has obtained images at a cellular level, color electronographs, and electrochronographic television images, his experiments demonstrating that under conditions of illness, modifications occur in light discharghes, and these phenomena creating the circumstances for a medical technique for exploration and diagnosis, which is superior to the techniques considered as classical ones. Received with obvious scientific interest throughout the world, Dr Dumitrescu's method, based on the so-called Kirlian photography, has rapidly earned a well-deserved prestige, many notable personalities in international science and technology underlining the exceptional nature of

It should be added that as a natural result of his serious work and assiduous research, Ioan Florin Dumitrescu received from the Bucharest congress other indications of his international fame, proofs of esteem and recignition of his value as scientist, and testimonials to the tradition and soundness of the Romanian school of medicine, whose renown he strengthens not only through his efforts and his qualities, but also as a consequence of his notable domestic collaborations and of the outstanding working conditions provided for him by our party and state. Thus, the Romanian doctor was elected to be an honorary member of the Canadian Acupuncture Society, and asked to become one of the directors of the well-known scientific forum, the International Kirlian Research Association (IKRA), of Brooklyn, New York ("...a member of our board of directors..."). Several lines from the letter sent to Dr Dumitrescu by Edward Graff, executive director of IKRA, illustrate the contribution of the Romanian man of science to medical progress: "...all American scientists have been impressed by your contribution... Your electromorphic effect provides a promise, and seems to represent an invaluable assistance in establising diagnostics."

Another unpublished document was to provide us with a further recognition of the value and importance of the studies conducted by Romanian researchers in the field that the scientific world calls Kirlian photography, and which represents a forward step in the analysis of the macro and microcellular levels of biologic systems by means of their electrical characteristics. This document is a note from a member of the United States Congress, Stephen J. Solarz, requesting the collaboration of the National Institute of Health, of Bethesda, Maryland, in support of IKRA's immediate intentions, specifying as one of the very important scientific projects of this organization, the need for a study trip to Romania, to observe on the spot the exceptional achievements of our researchers, who in many respects are pathfinders in the field. Given the magnitude of its other urgent projects, among which are the organization of a world-wide conference under the sponsorhip of the UN, and the opening of a national research laboratory in the United States, we can affirm that the inclusion of a "study trip to Russia and Romania" among IKRA's list of priorities, as an indication of the interest of specialists from a country with an old tradition of medical technology, represents an eloquent proof of Romanian intelligence in action and of the value attached abroad to our research, which achieves prestigious successes in a work and responsibility climate assured by our party and state at all times and in all ways.

The International Congress on Scientific Acupuncture and Applied Technology, chaired by academician Stefan Milcu, vice-chairman of the Academy of Medical Sciences and of the Romanian Association of Scientists, closed with a special session, during which several foreign and Romanian participants received distinctions and diplomas. A special diploma was awarded to Dr Vasile Boici, of Timisoara, inventor of the drug Boicil forte, for "outstanding organizational merit and active contribution to the teaching, practice, and techical progress of acupuncture." Vasile Boici coordinates a collective at the Timisoara Experimental Center, a name which has persisted from habit and obviously improperly, since the time when the great virtue of Boicil in treating all

types of rheumatic pains became known throughout the world and was patented in a large number of countries. Dr Boici and his collective presented three communications which were received with great interest: "General Considerations on the Medicinal Product Boicil Forte (Dr Vasile Boici), "Algotherapy with Boicil Forte by the Method of Locodolenti Microinfiltrations" (Dr Dumitru Mateciuc), and "Algopuncture with Boicil Forte in Post-Traumatic Sequels" (Dr Titus Petroviciu). Being among those who from the beginning have been convinced of the value of the drug produced after years of research, and after years of work and testing by Vasile Boici, we now derive new satisfaction in informing our readers the Boicil forte was recently patented in the United States; this is a new and conclusive proof of its therapeutic importance as a remedy sometimes without equal in improving or curing a broad range of illnesses, foremost among which of course, are rheumatic ailments. Another satisfaction is to be able to write that together with the high ranked personalities of international science and technology which were awarded distinctions by the INTAC '77 congress, Romanian doctors and technicians whose work and activities were most often not spectacular, were also in a position to be mentioned for the first time on our pages. Special diplomas were given to Eng Nicolae Constantinescu, for invention patents and fundamental research at the frontier between electronics and medicine; to Dr Toader Caba, of Calan, whose latest book "Acupuncture, Tradition, and Modernism" was sold out within minutes at the Turist Hotel bookstalls; and Dr Dumitru Constantin Mirghia, as well as others, whose energies and knowledge have always been placed at the service of the oldest of mankind's ideals, mankind's health.

11,023
CSO: 2702

ROMANIA

CONSTRUCTION SPECIFICATIONS REVIEWED AFTER EARTHQUAKE DAMAGE

Bucharest STIINTA SI TEHNICA in Romanian No 5, May 77 p 10

/Article by Eng Mircea Neicu of "Design-Bucharest"/

/Text/ The damages caused by the 4 March 1977 earthquake to the old 7-16-story buildings is due to certain of its characteristics--speed, acceleration, period--and the coincidence between its period of vibration and the period of vibration of the high buildings of frame structure as well as the inadequate design concept of the apartment buildings built before 1940.

With regard to the new apartment buildings, which bore up well (66 apartments destroyed of a total of about 300,000 built in the last 20-25 years), the appearance of some damage was caused by the fact that these buildings--as a matter of fact, well conceived antiseismically--calculated for a shock of .025-.060 g ($g=9.81\ m/s^2$) had to take on forces 5-10 times larger. In accordance with data supplied by the Research Institute for Constructions and Construction Economy, the horizontal oscillation in the north-south direction caused forces of .25 g.

As a result of examination of dozens of old apartment buildings in Bucharest, on the basis of the observation of the architectural plans and discovery of resistant structures, it clearly results that these buildings were designed without taking into account the effect of horizontal stress caused by earthquakes. Thus, a completely unregulated settling of the pillars was determined, as well as a lack of natural ties between the pillars and beams which form antiseismic frames, resting of beams on brackets, pillars on beams, removal of some parts of the construction in the bracket (the so-called bow windows) and so forth. All these characteristics denote a total lack of antiseismic concept.

Nor can we ignore the poor quality of the B100-140 type concrete (compared with the minimum B200 which we have utilized in the

last 20-25 years), the small percentages of longitudinal and transverse reinforcement of the pillars as well as the presence of many defects in execution.

If we were to synthesize the causes which led to the destruction or powerful damaging of some buildings, we would determine the following: poor behavior of the old apartment buildings due to the lack of seismic calculations (in the construction regulations preceding 1940 there were not even directions in this regard), the use of poor-quality construction materials as well as some errors in execution.

The natural question which would result from the above conclusions would be as follows: Why did many old apartment buildings resist under more or less good conditions? This is the builders' reply: The padding (nonstructural) walls took the seismic shock, were cracked but retained the building's resistant structure, espcially the pillars. The buildings with padding masonry of 14-28 cm, well executed, suffered very little compared with those which had 7-cm walls (brick placed on the edge), and they were unable to act as an antiseismic diaphragm.

The low buildings with a maximum of five floors and the new as well as old ones bore up very well. Damages were recorded only for the very old buildings with poor-quality bearing masonry and with wooden slabs.

As is known, on the basis of the dispositionsreceived from the party and state organs, a vast action has begun to consolidate the damaged buildings which must be brought back into use in the shortest possible time.

How is a plan for strengthening of the old buildings drawn up?

In the first place it is necessary to make a general examination of the construction on the basis of the architectural and resistance specifications, after which a detailed examination should be made of the damages caused by the earthquake and the causes which produced them. Most times it is necessary to research the quality of the concrete through nondestructive methods (sclerometer or ultrasound) and determine the position and diameters of the reinforcements through /pahometrare/

The next phase consists of evaluating the building's resistance as a whole and finding the most appropriate measures of fortification which would give the structure an increased degree of safety at least equal to what it had prior to 1940.

Finally, on the basis of the general concept one would proceed to draw up the details of execution for each element of construction damaged.

The importance of the operation of fortification requires solid theoretical training, much experience, perseverance and a gram of talent from the design engineer. In order to better illustrate what has been stated above we will give two examples of apartment buildings fortified after the 1940 earthquake: the Podgoria and Romarta apartment buildings.

Both buildings had fortified pillars which resisted; in exchange, the nonfortified pillars were severely damaged. This fact proves that the causes of deterioriation produced by the earthquake were not researched and evaluated enough.

I have stressed this aspect since in many cases even the undamaged construction elements are to be fortified for the purpose of avoiding the appearance of a lack of symmetry in the structure of resistance, lack of symmetry which cause particularly dangerous dynamic torsions for the building.

For the purpose of simplifying and unifying the design, "indicators on fortification of damaged reinforced concrete structures" were worked out, while the fortification designs being drawn up by the Bucharest Design Institute are being advised by a central technical commission formed of representatives of the State General Inspectorate for Construction and Investments, the Bucharest Construction Institute and the "Design-Bucharest" Institute.

8071
CSO: 2702

ROUND TABLE DISCUSSION ON NUCLEAR ENERGY

Ljubljana NASI RAZGLEDI in Slovenian 6 May 77 pp 223-225

[Text] The old but colorful parable of humanity which found itself holding the atomic nucleus in its hands speaks of the fairy tale Aladdin and the mighty Genie that was trapped in a bottle--will the boy be able to tame his power or will it get out of hand and threaten him with destruction?

Nuclear energy, unfortunately, became known to us as a destructive weapon. We are still justified in being cautious when we direct its use to peaceful purposes. This caution is raising doubts at every major step including a project such as in the construction of the first Slovenian nuclear electric power plant at Krsko. The promises of progress and utility we expect from this power plant are accompanied by doubts and trepedation with which the project is followed.

Recently, on invitation of Radio Ljubljana, program "Studio at 5 O'Clock," a panel of experts assembled in the reactor building Podgorica near Ljubljana to shed some light on the questions connected with the Krsko nuclear electric power plant which are of interest to the public.

Participating in the discussion were: Professor Dr Milan Osredkar, member of the Executive Council and president of the committee on scientific research; Drago Petrovic, member of the Executive Committee and president of the committee on energetics; Professional Engineer Janez Dular, director of the Nuclear Electric Power Plant Krsko; Professional Engineer Franc Braniselj, director of the uranium mine at Zirovski Vrh; Dr Boris Frlec, director of the Jozef Stefan Institute. Journalist Tone Vahen acted as moderator, and Stane Urek prepared the article for the press.

Question: The mere fact that we are gathered for the round table discussion of the "Studio at 5 O'Clock" program in the Podgorica reactor center of the Jozef Stefan Institute indicates that this may be a symbolic gesture and that the topic of our discussion will be the importance of nuclear energy in the future development of our economy.

For introduction I should like to briefly summarize an article that appeared in the daily press on the recent session of the Federal Council for International Relations in Belgrade. The council found that within the last few years, particularly after the energy crisis broke out, worldwide interest in the application of nuclear energy increased considerably and tended to favor accelerated development. Numerous countries, especially those that have no substantial classical energy resources--that is, hydraulic energy, oil, and coal--among which Yugoslavia, too, is included, are planning construction of installations for conversion of nuclear energy because this is a prerequisite for their economic development. Yuglslavia plans to meet a considerable part of its energy requirements with nuclear energy. The leading nuclear powers, organized in the so-called "London Nuclear Club" want to preserve their monopoly. They are impeding and even preventing utilization of this scientific discovery for development on the ostensible grounds that it is necessary to prevent proliferation of nuclear weapons. Thus the report of the meeting of the Federal Council for International Relations.

We are interested in the state of affairs in the Slovenian and Yugoslav energy resources management and to what extent does nuclear energy play a role in these resources. We know that construction of the nuclear electric power plant at Krsko has been going on for 3 years now and with this experience we certainly can say quite a few things to elucidate the situation both at home and abroad.

Petrovic: So far as the use of nuclear energy in Yugoslavia is concerned, there is no question that we have barely entered this era. Despite the prior efforts of all our scientific institutions working in the nuclear energy fields and construction of the nuclear electric power plant began relatively late. Accordingly, we are planning in the current five-year plan for only a relatively modest portion of electrical energy to be generated by our first nuclear electric power plant in Krsko. It is true that estimates and calculations are appearing which give a relatively important place to nuclear energy in this country. Yugoslavia produced in 1975 over 41,000 gigawatt hours of electrical energy; it is estimated that the consumption will amount to 67,000 gigawatt hours in 1980, 130,000 in 1990, and 250,000 in the year 2000. It is estimated that by 1995 nuclear power plants with capacity from 4,000 to 7,000 megawatt will be built. In addition to the nuclear electric power plant at Krsko a second nuclear electric power plant with a capacity of 800 to 1,000 megawatt will be built in Croatia, a third with a capacity of 1,000 megawatt somewhere in Serbia. It has not yet been decided where the fourth and the fifth plants will be built but their total capacity should amount to 2,000 megawatts, so that by 1990 there would be a total of approximately 4,500 megawatt available from the nuclear electric power generating plants.

Naturally, in this connection the question arises as to why the future development was planned in this way, because if the plans for building the above 4,500 megawatt capacities this would represent approximately 20 percent of the total electrical energy consumed in 1990. In this connection the question arises why is this percentage relatively high if we consider that according to some estimates nuclear energy will in the year 2000 constitute 40 percent of the total electrical energy in Yugoslavia.

The hydraulic power potential that is still available in Yuguslavia amounts to 23,000 gigawatthours. This is the so-called exploitable part which can be still harnessed with new construction. The reserves of coal are estimated to amount to approximately 21 billion tons with an average caloric value of 2,030 kilocalorie per kilogram. Most of this coal is lignite with an average caloric value of 1,600 to 2,000 kilocalories.

The problem in connection with the construction of classical thermoelectric power plants using coal as their basic fuel is primarily this: 1) the reserves of coal are very unevenly distributed; 2) coal is very sensitive to transportation, hence all thermoelectric power plants must be located near the sources of coal; 3) construction of thermoelectric power plants presents very acute problems of water used for the cooling of condensed steam, cinders, and sulfur and carbon dioxides and their impact on the environment; 4) there also is a problem of electric power transmission from the coal producing basins.

We have no oil or natural gas or their reserves are relatively meager. In our judgment using oil and natural gas for electric power generation would be contrary to the principles of our energy policy. A possible exception would represent use of the residue from the refineries where smaller thermoelectric power generating plants fueled by crude oil would be constructed.

With respect to nuclear fuel it is known that Yugoslavia has approximately 36 to 37,000 tons of usable reserves which, however, must still be confirmed. Moreover, there are still entire regions that are wide open for new prospecting. These estimates are low because very little surveying and prospecting has been performed.

Although completion of the 380 kilovolt distribution network makes possible the inclusion of nuclear electric power plants in the Yugoslav energy resources system and the possibility of including the nuclear electric power plants has become in our judgment an accepted fact, it is, of course, necessary to consider in implementing the nuclear power plants program certain premises which limit the expansion of their construction and the rapidity with which the program plans up to the year 2000 are to be developed. I should like to mention briefly what are these factors because I think that they are very important for nuclear energy and will have a decisive role in carrying out the planned programs.

The first problem is the securing of adequate quantities of nuclear fuel. To operate for 30 years the first two nuclear electric power plants that are planned with a rather high degree of reliability, considering that one is already under construction while the construction of the other will shortly be agreed upon by an interrepublic agreement between Slovenia and Croatia, and the third that is to be built immediately afterwards at a rated power of 2,000 megawatts, 18,000 tons of uranium concentrate is required. With intensive further research it may be expected that the uranium mine at Zirovski Vrh will be able to supply the needs of only two nuclear power plants. It is essential, however, that further research in the uranium mine at Zirovski Vrh be intensified and that all the hitherto imprecisely determined reserves be enhanced.

Should we fail to do this, we shall after 1985 depend entirely on imported fuel the cost of which has increased by more than 400 percent since 1970. This was the highest price increase of any fuel since 1970. The price increase of nuclear fuel was even higher than that of oil.

Question: What does this price increase by a factor of 4 or 5 per unit of fuel mean in terms of the operating expenses of a nuclear electric power plant? It is known that precisely the fuel expense of a nuclear electric power plant reflected in the price of a kilowatt hour is very low.

Osredkar: It means something else. It means that this price is quite artificially inflated. There are no economic reasons for this price to climb so high. All the reasons for the increase in price are completely without explanation on the economic grounds, they may be purely strategic or speculative in nature.

Question: Let us talk about the prospecting that has been carried out so far. We know a great deal about Zirovski Vrh but has the rest of the vast Yugoslav area been surveyed with sufficient thoroughness to warrant a pessimistic view in this respect?

Braniselj: There are plenty of uranium ore deposits in this country and their location is relatively easy and inexpensive to establish. For us it is important that it is precisely in Slovenia where the most interesting uranium areas have been found. Here we have already found five uranium ore deposits. The largest and the best known deposit of uranium is at Zirovski Vrh. That location has thus far been surveyed in sufficient detail to permit the geologists to guarantee that the ore mined in the next 15 years will yield at least 1,800 tons of uranium oxide. Of course, there probably are additional resources. However, to transform the uranium ore deposits into reliable reserves ready for mining extensive, detailed, lengthy, and expensive mineral research is required. The quantity of usable reserves is practically directly proportional to the money available for mineral research. On the average each additional kilogram of usable ore requires an investment of 100 dinars made 5 years in advance.

Question: The fact that we shall by the year 2000 require approximately five times more energy than we do today is actually the driving force which is directing and impelling us to an intensive search for nuclear fuel raw materials, is it not?

Copic: Let us offer a popular illustration. If we take the figure of 5,000 tons of uranium concentrate, which our study of the energy resources compex for Slovenia considers to be the usable uranium reserve, and compare with this our reserves of coal and that part of hydraulic energy which our electric power plants can in the next 50 years convert into electrical energy we can say that we have as much energy available from uranium as can be derived from the usable hydraulic resources in the next 50 years or as much as there is available in all our resources of lignite and bituminous coal. Each of these resources represents one third of the energy supply. This holds for Slovenia. The situation is very similar for the rest of Yugoslavia with the exception that there is more of lignite in the Kosovo and Siberia basins. I am emphasizing that this relationship holds for the use of uranium in the light water reactors, that is, of the type that is now under construction at Krsko where the efficiency is approximately one percent or even something less than that. In France, however, they are already operating the Phoenix, that is, a fast breeder reactor where the efficiency of uranium ore utilization is more than 50 times greater. This means that our known existing reserves of uranium are practically 50 times greater than our reserves of fossil fuels. Moreover, uranium is a domestically available raw material.

The question is, however, whether we can today or in the near future (when it will be necessary to make the transition to a more advanced form of utilization of uranium), accomplish all the necessary things that would enable us actaully to make use of such advances in accordance with the international, economic, political, and other constraints.

With respect to the supply of uranium we are approximately in the same position as the industrial countries of the West. If we build only light water reactors, a shortage of uranium will be experienced as early as in the late eighties. Two solutions of this problem are possible. The present prospecting for uranium could be greatly expanded, new mines could be opened at an accelerated pace, and the capacities of the uranium enrichment plants could be greatly increased or, in the alternative, a transition to plutonium fuel should be accomplished within the foreseeable future first in the light water reactors and then in the fast breeder reactors. As an illustration let me quote our example. If the predictions concerning the construction of nuclear electric power plants, mentioned in the introduction by comrade Petrovic, materialize we shall by 1992 have enough of our own plutonium for the first breeder reactor in Yugoslavia. However, should the policy of the United States President Carter propounded in his election campaign prevail in the world, there simply will be no plutonium

fuel available because of his dominant preoccupation with nonproliferation of nuclear weapons. Carter is apparently prepared to sacrifice the energy and economic advantages for his political stability and the privileged position of nuclear superpowers. The French, Germans, and a host of developing countries resist Carter's political pressure trying to maintain their independence and sovereignty also in the area of nuclear energy utilization. This was discussed by our Federal Council for International Relations. However, adoption of such policy requires much more than sheer political will.

Question: This means that we need expertise, funds, and time. I am afraid that time is a commodity which is in a very short supply. We are in 1977 and there are only 23 years until the year 2000. How much time is needed from the start, from the conceptual plan, to the first kilowatt hours generated by the nuclear electric power plant?

Dular: According to our experience so far, it takes at least 10 years from the time the first ideas for a project like the Krsko nuclear electric power plant are advanced and the time the plant is completed. Moreover, for the nuclear electric power plant at Krsko we have a contract which provides for the delivery and completion of the electric power plant within a relatively short time which in the future will no longer be offered in the contract specifications for construction of the future nuclear electric power plants; in the future the time required for completion will be considerably longer. Specifically, in case of the Krsko nuclear power plant, the term specified in the contract is 54 months but contracts that are being signed these days specify 70 or even 76 months. That is six years and more. The time runs from the date the contract is signed to the time when the plant is put on line for commercial operation. Prior to the signing of the contract, however, it is necessary to go through a number of preparatory phases so that it takes even today ten years between the time the idea is formulated and the completion of the project.

Question: According to the interrepublic agreement referred to earlier it has been decided to build another nuclear electric power plant in Croatia which is expected to become operational in 1985 if, of course, the original agreements are still in effect. Are the present preparations going in this direction and have we already progressed so far?

Dular: I am afraid that the way we are going about it at present is somewhat too slow if we want to meet the 1985 target date for completion of the nuclear electric power plant that is to be built on the basis of the agreement between the two republics. I think that work on this project should be intensified, the teams should be increased by additional personnel and they should put more effort in their work.

Question: Do we have the personnel required for a simultaneous construction of several nuclear electric power plants in the near future?

Osredkar: I would rather ask if we are able to undertake simultaneous consturction of any kind of projects of this size. It does not matter at all if the construction involves a nuclear electric power plant, a conventional power generating plant, or some other kind of plant. This is a problem common to large industrial objects regardless of their end use or technology. If we take a separate look at the nuclear power plants and specifically at their nuclear part, we already know that we have neither enough general purpose experts for this installation nor specialists in the nuclear engineering field. This is a very obvious consequence of our long time thinking that we had no need for people who were interested to work on nuclear problems, not even if their work were confined to the laboratory or some smaller group. As a consequence we have not been able to find the appropriate personnel despite the fact that in 1963 specialized courses for professional engineers in all disciplines were introduced at the university.

Naturally, these courses stagnated and the interest for them ebbed away for the simple reason that the preparations for the construction were dragging out for full 10 years.

Frlec: Frequently simplifications are used in public discussions which can be misleading. For example, we speak about burning the uranium from Zirovsk Vrh in the Krsko nuclear power plant. Of course, uranium ore is not coal for stoking a furnace. There is another step involved, namely manufacture of fuel elements. This is a technological process available today only to the technologically most advanced countries. In the early sixties we had in Yugoslavia a good or at least conceptually very clearly formulated and ambitious program of nuclear development. The objective of that program was to put in operation by 1974 the first nuclear power plant produced entirely by domestic resources and using domestic nuclear fuel. At that time four large institutes for nuclear research were operating in Yugoslavia under the auspicies of the Federal Nuclear Energy Commission, namely, Boris Kidric in Vinca, Rudjer Boskovic in Zagreb, Jozef Stefan in Ljubljana, Institute of Mineral Raw Materials in Belgrade, Geological Institute of Slovenia, and a few other, smaller organizations. According to a very rough estimate approximately 2,000 to 3,000 people worked in the field of nuclear energy in the early sixties. These people more or less covered the entire nuclear program. When, however, it became clear in the late sixties that the goals were by far beyond the reach of our material, technolgoical, and perhaps even organizational capabilities, the nuclear development program was cancelled and the greater part of our existing and developing nuclear experts had to redirect their interests to other areas. Some of them went their own way and in some instances we lost the nuclei of already existing groups.

Today, as you know, the need for experts in this field is reappearing. We find that our professional research capabilities in most of the nuclear areas are minimal. This holds particularly for the technology and processing of nuclear fuel. At the same time we find that the interest communities are willing to show continued understanding and provide funds only for those activities that were directly connected with the nuclear electric power plant at Krsko, with the larger research facilities such as the nuclear reactor, and elementary particle accelerators or related to the study of th environmental impact of radioactivity. Here we should also mention the groups which have been and still are prospecting for uranium or working on the uranium ore processing. All other activities which a sensibly conceived program requires were allowed to fall by the wayside. Of course, the personnel that worked in these areas was not altogether lost; it was only redirected to other fields because of the circumstances. If, then, we had today a well conceived nuclear development program with realistically set goals and if we could secure the necessary funding we could quite readily resurrect and enrich the potential expertise which we had possessed at one time. It goes without saying, however, that the consequences of a ten years' interruption which our nuclear program sustained cannot be corrected in a short time.

Dular: This is felt most acutely at the construction of the new nuclear electric power plant where we are encountering two problems from this area. One is lack of professional personnel at the construction itself, the other, which we are trying to solve in a more organized fashion because the time is not so pressing, is the problem of the operating crew for our first nuclear electric power plant and, at least in part, the nucleus of the operating crews of our future nuclear power plants.

Question: In the introduction it was mentioned that the London Nuclear Club desired to maintain its monopoly. A partial escape from the monopoly relationships would be precisely reliance upon domestic resources. What is the current situation of our industry? We have a few reputable enterprises which are taking part in virtually every capital investment project, be that in the field of energy resources management, or elsewhere?

Petrovic: I think that before we attempt to answer this, we must consider another important question, namely, the source of nuclear technology and the type of nuclear reactor for future nuclear electric power plants. The results of cooperation with the domestic industry in the construction of our first nuclear electric power plant are extremely modest. For this reason I think that all the interested parties, manufacturers of equipment, electrical energy resources management, and energy users should formulate a concept of engineering and technological uniformity of nuclear electric power plant development even before we adopt the final decision on the construction of new ones. Poor organization, poor coordination, and lack of information about the opportunities for participation of our industry in the construction of the nuclear giants have as a consequence a very modest

participation of domestic industry in the first nuclear electric power plant. I think that it would not be appropriate to try to place the blame solely with our domestic industry. It is also a matter of attitude on the part of the principal contractor toward domestic industry. In addition other, as yet unresolved problems, contributed to the substantial reduction of the originally planned 15 percent of equipment that was to be supplied by domestic industry. This is primarily indicative of the fact that we have not yet given adequate attention to participation of domestic industry in planning the construction.

The results in the first nuclear electric power plant will, of course, show that the participation of our industry and experience gleaned by our manufacturers of equipment are very meager indeed. I think that when decisions are made on the acquisition of new nuclear installations the domestic industry should be included to the fullest extent possible in the unified plan for selection of the reactor and nuclear technology similarly as is done in all the developed countries. It is no accident that today a number of countries which do not have their own manufacturers of nuclear equipment contribute more than 50 percent of their domestic products in the manufacture of nuclear power plants. In Yugoslavia we have extremely capable organizations with expertise both in construction as well as in production of certain types of equipment; it is only necessary to organize them in a cooperative effort. At Krsko we were only partially successful in involving Litostroj, Metalna Maribor, Hidromontaza, and Djuro Djakovic. Their contributions, however, were only of peripheral significance with respect to the overall value of the installed equipment. We are mostly engaged in carrying out of the basic support work, construction, and installations. Our results with respect to equipment are very modest and we must not be content with it to remain at the present level. In the future contract negotiations on new installations we should insist on including equipment of domestic manufacture to the largest possible extent. We must not allow ourselves to be compelled by the time element in accepting the conditions forced on us by the equipment supplier. This, I believe, is part of the experience acquired in connection with the building of our first nuclear power plant on which we can draw when we negotiate the contracts for the next one.

Dular: This is actually a matter of organizing the approach to the construction of the second nuclear electric power plant on the basis of experience gleaned in the process of building the first nuclear electric power plant. I think that the key step here is utilization of domestic design capabilities in the conceptual scheme for the second nuclear electric power plant because our designers are familiar with the capabilities of the domestic industry and can thus facilitate the placement of its products to the fullest extent possible by specifying that domestic product is the new construction whenever possible.

Osredkar: We should broaden this subject somewhat so that we do not remain shrouded in a mystical nuclear aura. This pattern which is so pronounced at Krsko also was in the last few years apparent at all electric power generating plants as well as at other projects. Our organizational participation has been relatively small. We have been losing the design and organizational contracts and this is prompting a great deal of discussions on how to reverse this trend and assume as much responsibility as possible in areas ranging from the design to construction.

Question: What favorable results could ensue in the near future in view of this experience? We know what we should not do and what we must not omit. Are we now organized so that these mistakes will not be repeated?

Osredkar: The fact that we are using and developing our own brainpower and expertise for the conceptualization and organization of large construction projects.

Copic: And if we do not have enough of our own brainpower, we must enrich them with foreign brainpower rather than letting the foreign brainpower to do everything.

Frlec: There is another thing that should be emphasized. It is necessary to make some investments in the domestic brainpower. Brains do not grow on trees like fruit where it only has to be picked and harvested.

Osredkar: In May the International Atomic Energy Agency will sponsor a conference in Salzburg. The conference will deal with problems related to nuclear fuel, the entire complex problematics of nuclear fuel. Special emphasis at this symposium will be given to the idea of regional centers for the processing of nuclear fuel advanced by the Americans a few years ago. In view of the change in their policy the Americans are now backing out of this proposal because they wish to process all the fuel themselves so that they can retain and hide away any residual leftovers. For us this and numerous similar conferences are important because it enables people who work in the field of nuclear fuel to establish personal contact and exchange the latest information.

More interesting is perhaps the question as to what is actually the agency's mission. This is well worth discussing especially because Yugoslavia, which I represent on the Governing Board, advocates the position, that the charter of the agency should be interpreted and observed strictly as they are written instead of merely using the agency as an international police agency for prevention of the abuse of nuclear energy for military purposes. The charter provides that the primary mission of the agency is to render assistance in the development of nuclear energy and states that proper precautions to prevent abuse of nuclear energy are only incidental to the

primary mission. In practice, particularly in the recent years, however, the agency has because of monopolistic tendencies of the big powers been much more active in the field of surveillance of nuclear energy applications than in the field of expansion of its peaceful use.

Question: We also are facing the problems of nuclear electric power plants concerning the nuclear waste and excess thermal energy, that is, problems of adverse environmental impact. I would like a clear statement as to how does this adverse environmental impact compare with the adverse impact of the present energy resources. This topic is often neglected in the discussions and we somehow are not getting a clear picture.

Copic: This is a matter of the whole panoply of problems associated with the terminal phase of the nuclear fuel cycle. These problems fall in two groups. One, to which belongs the problem of waste, is purely technical, while the other, as we have heard from Professor Osredkar, is political in its nature. The problem is that as utilization of nuclear energy in nuclear electric power plants becomes widespread, the number of countries having the capability to manufacture plutonium which is a byproduct of nuclear energy is also increasing. And here we are now faced with the key political problem, namely, how to establish the surveillance over this plutonium in order to prevent proliferation of nuclear weapons. This is at the root of all campaigns conducted under the auspices of the London Nuclear Club whereby pressure is applied on all member states of the agency and where the new policy of Mr Carter, the new American president, is most vigorously pursued. The matter was further complicated when it turned out that the old American plants for the reprocessing of used up nuclear fuel elements are not suitable for the heavily irradiated fuel from the nuclear electric power plants that are now in operation. At present not a single nuclear fuel reprocessing plant in the United States is operating. They can do nothing more than store the used up fuel elements in storage pools. And this is already a great political and economic problem. Because of their existing policy the Americans are trying to force everybody else into agreeing to simply store all used fuel elements instead of reprocessing them. At least not for the time being as it was already proposed by Ford in his declaration suggesting a three year moratorium until the matters can be straightened out and the political problems connected with the surveillance of nuclear weapons proliferation are resolved. This is one part of it. The second part, which has recently gained so much notoriety and which has been widely exploited against nuclear energy, is precisely the question what to do with the waste that is left over at the processing of nuclear fuel after purified uranium and plutonium are extracted. I can say that this problem has been considerably inflated as were a number of similar problems before. The processes are now well developed from the technological point of view. Research performed both in the United States and in Germany indicates that modern technological processes can ensure very safe storage of highly radioactive waste from nuclear fuel reprocessing plants in dry geological structures such as are, for example, abandoned salt mines.

Of course, this is one kind of waste which is at present most talked about. There are, however, other kinds of waste which are found in every plant including the nuclear electric power plants. These are the so-called wastes of low and intermediate radioactivity which appear in large volumes. However, here too, appropriate processes have been developed so that even this waste can be by application of well developed methods and under proper supervision safely processed and stored if, of course, suitable and timely preparations are made. Our preparations in this area are somewhat behind of schedule.

Question: How about the answer of the second part of the question? How does the environmental impact and problems caused by this waste compare with the adverse effect of the noxious side product associated with the classical methods of energy conversion?

Branisely: Perhaps this will sound strange, but it is true that the nuclear processes are relatively simple and that the effects of these processes can be more easily predicted and controlled than, for example, the effects of the combusion of oil or solid fossil fuels. It is well known that shippers of oil have been destroying the seas. The Mediterranean, for example, is already seriously endangered because of irresponsible discharging of residual oil to lower the transportation costs. I feel that environmental protection is an economic rather than technolgoical problem. I am convinced that apart from hydraulic power, nuclear power is one of the cleanest energy resources.

Question: Excess heat also constitutes pollution. It is only a year since a rather lively debate on the cooling problems of the nuclear electric power plant at Krsko finally simmered down. How will this problem be resolved?

Dular: Thermal pollution is not a problem that is peculiar to nuclear electric power plant but is present in all classical thermoelectric power plants. What may perhaps be peculiar to the nuclear electric power plant is the fact that heat losses, that is, excess heat transferred to water, are somewhat higher. This is because in a nuclear electric power plant excess heat is not removed by the combustion gasses escaping through the smokestack. This is one thing. The other is the slightly lower thermal efficiency of nuclear electric power plants. For this reason the excess heat which the cooling water must transfer to the environment is greater in nuclear electric power plants but not very substantially greater than in classical thermoelectric power plants using coal, natural gas or oil as fuel. In the specific case of Krsko the problem was resolved by determining that we may use the cooling water only under prescribed conditions. We are allowed to take only a certain quantity of the cooling water from the Sava River. The rest of excess heat must, when the affluents of the Sava River are too small and we wish to operate at full rated power, be removed

by additional cooling of the steam turbine condensate in the cooling towers. Therefore the nuclear electric power plant at Krsko is designed so that it is partly cooled by water from the Sava River and partly by the cooling tower as topping units.

Question: A very simple question: how many kilometers will the Sava River have to traverse before its temperature drops back to normal?

Dular: We are allowed to rise the water temperature at the site by 2 degrees Centigrade but the temperature must never exceed 28 degrees Centigrade. This is the decision of the siting decree for the nuclear electric power plant. We shall at all times and under all operating conditions observe these limits. Measurements that have been thus far carried out show that the river temperature will, because of mixing and other causes, drop by one degree by the time the water reaches the border of the Socialist Republic of Croatia. This means that the water will be only one degree warmer when it passes the border between Croatia and Slovenia.

Question: Considering the amount of water in our rivers the question arises whether it is physically possible to build the planned 18, 19 or 20 nuclear electric power plants by the year 2000, leaving aside all other difficulties.

Copic: In Germany they have already a few years ago prohibited further construction of nuclear electric power plants with flow-through cooling. They had quite a row with the French because they built a twin nuclear power plant with flow-through cooling at Fezenheim. In Yugoslavia we shall, except at a few locations, not be in position to build larger new plants with flow-through cooling: it will be necessary to change to cooling towers which has been standard practice of long standing with the thermoelectric power plants located at lignite strip mining operations.

Osredkar: It will be necessary to make the transition from open towers to enclosed towers.

Question: How about atomic heating plants?

Copic: One of the important new advances in the field of energy resources management will be precisely the utilization of nuclear heat for space heating. Space heating is one of our more important problems because it uses up a great amount of energy and will use even more in the future. It will be necessary to use heat more efficiently. Our plans for the period up to the year 2000 are taking this into account. At that time heating and nuclear sources should supply approximately 42 percent of the necessary appropriate heat from nuclear sources. This is one of the estimates of the macroproject study.

Question: The investments required for nuclear energy are very large. Seeing how the cost of the present construction is skyrocketing we are interested whether we as a society are at this point in time organized so that we can make these investments from our own resources or must we seek foreign financing.

Petrovic: In the recent time the situation has become somewhat more clear. I must state that in 1973 we proceeded with a program of construction in the field of electrical energy resources where the ratio of domestic to foreign resources was 50:50 but in 1977 we have in the same program a ratio of 65:35 between the domestic and foreign resources. It is unquestionable that this is a huge capital transaction particularly at the present intensive pace of construction. At the moment we are building seven electric power plants which represent an extremely large outlay that must be made by the economy. Funds invested in the electrical energy resources economy and coal mines constitute according to our estimates almost 35 to 40 percent of all the investments in the economy. This shows that the loading is relatively strong and that we shall throughout the 25 year program of energy resources development until the year 2000 have to permanently invest approximately 2.5 percent of the social product in energy resources development. According to some estimates this figure is too modest. It is true that everything will have to be rationed to a high degree. On one hand it will be necessary to build according to a prudently optimized procedure while on the other ensure through conservation in energy use that the necessary part of the social product is as small as possible. We must, namely, proceed from the fact that in the previous decade, between 1965 and 1975 we were separating out only 1.75 percent of the social product. Now we are going to 3 percent to make up for what was lost but later it will be necessary to more or less stabilize these matters. In comparison with the previous periods when the system of funding the construction of electric power installations was based entirely on statutory provisions and on the funds available to the electrical energy resources economy itself we are now in our judgment already much better organized in the self-managing interest community of the electrical energy resources economy. Today the fundamental principle of the pooling of funds for construction of electrical energy plants is conceived within the framework of self-managing agreements that are already in force. The funds are pooled on the basis of committed investments, on the basis of electrical energy consumption, and on the basis of income.

This means that all criteria have been included, namely, the criteria of solidarity and mutual assistance as well as the criteria of investment and electrical energy consumption. In my judgment the load of electric power plant construction is extremely well distributed over all users and I feel that the present level of pooling the funds and the degree of organization within the electrical energy resources economy interest community is a good foundation for a satisfactory resolution of the problems of the electrical energy resources development.

Of course, construction of electrical energy power plants by itself is not everything. It does not constitute all the energy we use. There still remains a host of open problems in the fields of other energy resources. Therefore we are now seriously considering integration of all energy interest communities in Slovenia, namely, the interest community for oil and natural gas, electrical power resources interest community, and the operating association for coal mining, and establish a concept of a unified energy resources community. Our problems in the area of electrical energy resources economy concern only 17 percent of the energy consumption. The remaining 83 percent include other sources which, however, have no adequate response in the pooled funds system, the system of expanded reproduction, and in the the overall system of energy resources operations. I must say, however, that solid advances have been made in the electrical energy resources economy. These advances were made not only by virtue of the legislation on electrical energy resources economy but also because a sufficiently early recognition that it was essential to be well organized in this area and that electrical energy is one of the basic prerequisites of economic development. In planning any kind of expansion we must first secure electric power which is no longer freely available. It is necessary to realize that energy is becoming increasingly more expensive, that it is necessary to include it in the economic development as its integral part, and that one must closely follow all the aspect of its use.

Frlec: I suggest that we resume our discussion of nuclear fuel. I think that the poor understanding of what is actually happening with the fuel in a nuclear reactor should be clarified. As uranium is consumed in a nuclear reactor, the uranium content in the fuel rods decreases by only a few percent; at the same time enough of fission products accumulate in the rods to virtually prevent further fissioning of the uranium. This means that the process has relatively poor efficiency. One of the principal wastes in the reprocessing of used up fuel rods is uranium which, of course, can be reused. It is often forgotten that this uranium has a low isotope content and that it must be either enriched or at least used up in uranium compounds. Because this ordinarily involves the volatile uranium hexafluoride, there probably will be no difficulty in its application for some other technological process.

Today we also spoke about plutonium. One of the things the public does not understand too well is the fact that a country which is producing plutonium in its nuclear power plants also has the capability to manufacture nuclear explosives. I think that this is again one of the very crude generalizations. Every plant for reprocessing of used nuclear fuel represents at least one of the top technological accomplishments. These are very complicated remotely controlled installations which once put in operation can because of radioactivity no longer be repaired if they break down. Frequently one hears or reads that it is nowadays possible to assemble a nuclear device

at home, in the basement, so to speak. Here it is only necessary to say that plutonium is an extremely toxic substance with one-millionth of a gram constituting a lethal dose for humans. In addition, plutonium is a highly radioactive substance. I think that everyone who has heard about this realizes that plutonium, even if it could be somehow procured or stolen, should be handled only by persons who know what they are doing. A substance like this can in this country be handled only at a few properly equipped locations. For these reasons it is ridiculous to maintain that nuclear explosives can be made in one's basement. Naturally, and we have read about this, too, that anyone who knows something about physics can, if he wants to, work out a design for a nuclear device, since it is not difficult to get data on the critical mass. Even if the design were crude and technologically unrefined there is no reason for such device not to explode, if it were produced.

Osredkar: In conclusion it may be appropriate to say this: The problem is how to ensure that the Nuclear Weapons Nonproliferation Treaty, signed in 1970, is observed. In the treaty the superpowers pledged to disarm and end what is called the nuclear arms race. In addition they also pledged not to interfere with endeavors to develop nuclear technology and utilize nuclear energy and, moreover, offer to provide the greatest possible assistance for this purpose. If we look at the actual situation we see that the nuclear arms race did not end at all and the recent interventions show that the assistance rendered by the developed countries to those that need nuclear energy is even less than what it used to be prior to the signing of the Nuclear Nonproliferation Treaty and certainly not greater. Nuclear energy is one of the most powerful weapons of the developed countries and this, in my opinion, is the main problem.

12070
CSO: 2802

END